

Summary

Campylobacteriosis, mainly caused by *Campylobacter jejuni*, is one of the most common food-borne infections worldwide and manifests itself symptomatically through watery, sometimes bloody diarrhea. While these infections are systematically monitored and treated accordingly in Europe and North America, partially endemic conditions prevail in Africa and parts of Asia. The lack of surveillance leads to a lack of appropriate treatment of symptomatic diarrhea, resulting in a high mortality rate for children under the age of five. The main cause of infection with *C. jejuni* is the consumption of contaminated chicken meat. Anti-adhesive natural substances are inexpensive, globally available substances that have the potential to intervene early in the infection cascade and thus attenuate or even prevent infection.

In this thesis, numerous carbohydrates and carbohydrate-containing extracts from plants and fungi were investigated regarding their anti-adhesive effects against *C. jejuni* on intestinal Caco-2 epithelial cells to specifically influence early pathogen-host interaction, which is strongly characterized by carbohydrate-protein interactions.

In particular, high molecular weight extracts of fenugreek seeds (*Foenugraeci semen* from *Trigonella foenum-graecum*) and isolated β -glucans from yeast cell walls (*Saccharomyces cerevisiae*) inhibited the adhesion of *C. jejuni* to the intestinal cell line.

The high molecular weight fenugreek seed extract (FoenEx) was structurally characterized as a mixture of galactomannans (β -1,4-mannan backbone with α -1,6-branched α -1,4-/1,6-galactose side chains, Mannose-Galactose-Ratio 3:2) and proteins, such as Vicilin 47k. Vicilin 47k shows strong sequential similarities to anti-adhesive pea proteins. FoenEx inhibited the adhesion of *C. jejuni* to Caco-2 cells in a concentration-dependent manner, among other things by selectively inhibiting the bacterial adhesion protein JlpA, which induces inflammatory immune responses in the host cells during infection. In accordance with the inhibition of bacterial adhesion, the invasion of *C. jejuni* into Caco-2 cells was also reduced by treatment with FoenEx, so that a resulting infection could be attenuated. At the same time, motility, another essential virulence factor of *C. jejuni*, was reduced by FoenEx treatment. Overall, neither the viability of the Caco-2 cells nor the proliferation of *C. jejuni* was impaired.

The isolated β -glucans from yeast cell walls (BGL) inhibited bacterial adhesion to intestinal epithelial cells, but not via interaction with the adhesin JlpA. Inhibition of the invasion of *C. jejuni* into Caco-2 cells was also not observed. However, the phagocytosis activity of RAW 264.7 macrophages and correspondingly the internalization rate of *C. jejuni* by the immune

Summary

cells was significantly increased after BGL treatment, which may represent an important mechanism for the elimination of *C. jejuni* during human infection.

In summary, this study identified potent anti-adhesive natural products against *C. jejuni* from fenugreek seeds and yeast cell walls that have the potential to attenuate *Campylobacter* infection by inhibiting invasion of host cells through reduction of bacterial adhesion and by preventing *Campylobacter*-driven inflammatory processes or by increasing elimination of the pathogen by macrophages.